



Office/Ref. No.: CISCO-7703

Patent

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Hart et al.

Serial No.: 10/807,547

Filed: March 22, 2004

Title: CHANNEL TRACKING IN AN  
OFDM WIRELESS RECEIVER

Group Art Unit: 2661

Examiner:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**TRANSMITTAL: INFORMATION DISCLOSURE STATEMENT**

Dear Commissioner:

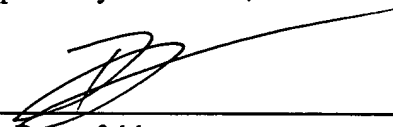
Transmitted herewith are:

- ☒ An Information Disclosure Statement for the above referenced patent application, together with PTO form 1449 and a copy of each reference cited in form 1449.
- ☐ A payment for petition fees.
- ☒ Return postcard.
- ☒ The commissioner is hereby authorized to charge payment of any missing fee associated with this communication or credit any overpayment to Deposit Account 50-0292.

A DUPLICATE OF THIS TRANSMITTAL IS ATTACHED

Date: June 14, 2004

Respectfully submitted,

  
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Attorney/Agent for Applicant(s)  
Reg. No. 38687

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**Certificate of Mailing under 37 CFR 1.8**

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Signature: 

Amy Drury



Our Docket/Ref. No.: CISCO-7703

Patent

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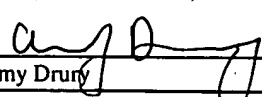
INFORMATION DISCLOSURE STATEMENT

Dear Commissioner:

This Information Disclosure Statement is submitted:

- ☒ under 37 CFR 1.97(b), or  
(Within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:
  - ☐ Certification under 37 CFR 1.97(e), or
  - ☐ a \$180.00 fee under 37 CFR 1.17(p)  
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)
- ☐ under 37 CFR 1.97(d) together with a:
  - ☐ Certification under 37 CFR 1.97(e), and
  - ☐ a petition under 37 CFR 1.97(d)(2)(ii), and
  - ☐ a \$130.00 petition fee set forth in 37 CFR 1.17(i)(1).  
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☒ Applicant(s) submit herewith Form PTO 1449-Information Disclosure Citation together with copies, of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56.

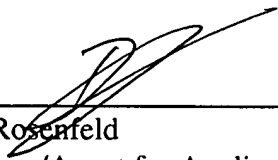
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It is expressly requested that the cited information be made of record in the application and appear among the "references cited" on any patent to issue therefrom.

As provided for by 37 CFR 1.97(g) and (h), no inference should be made that the information and references cited are prior art merely because they are in this statement and no representation is being made that a search has been conducted or that this statement encompasses all the possible relevant information.

Date: June 14, 2004

Respectfully submitted,



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Attorney/Agent for Applicant(s)  
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| <b>INFORMATION DISCLOSURE STATEMENT</b><br><br>(Use several sheets if necessary) |  |  |  | ATTY. DOCKET NO.<br>CISCO-7703 |  | SERIAL NO.<br>10/807,547 |  |
|  |  |  |  | APPLICANT<br>Hart et al.       |  |                          |  |
|  |  |  |  | FILING DATE<br>22 Mar 2004     |  | GROUP<br>2661            |  |

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JUN 17 2004  
PATENT & TRADEMARK OFFICE

| U.S. PATENT DOCUMENTS |                 |               |                       |       |           |                            |  |
|-----------------------|-----------------|---------------|-----------------------|-------|-----------|----------------------------|--|
| EXAMINER INITIAL      | DOCUMENT NUMBER | DATE          | NAME                  | CLASS | SUB-CLASS | FILING DATE IF APPROPRIATE |  |
| AA                    | 2002/0131516 A1 | Sep. 19, 2002 | El-Gamal et al.       | 375   | 285       | Nov. 5, 2001               |  |
| AB                    | 5,912,876       | Jun. 15, 1999 | H'mimy                | 370   | 210       | Jan. 15, 1997              |  |
| AC                    | 5,953,311       | Sep. 14, 1999 | Davies et al.         | 370   | 210       | Feb. 18, 1997              |  |
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| EXAMINER INITIAL         | DOCUMENT NUMBER | PUBLICATION DATE | COUNTRY | CLASS | SUB-CLASS | TRANSLATION YES   NO |  |
| AO                       |                 |                  |         |       |           |                      |  |

| OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.) |  |
|--|--|
| AP   | Ove Edfors, Magnus Sandell, Jan-Jaap van de Beek, Sarah Kate Wilson and Per Ola Borjesson. "Analysis of DFT-Based Channel Estimators for OFDM." <i>Wireless Personal Communications</i> , vol. 12, Issue 1, pp. 55-70, January 2000. |

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| EXAMINER | DATE CONSIDERED |
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\*EXAMINER: initial if citation considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include a copy of this form with next communication to Applicant.

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|  | BA |  |                     |                                |       |                          |                               |
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|  |    | DOCUMENT<br>NUMBER   | PUBLICATION<br>DATE | COUNTRY                        | CLASS | SUB-CLASS                | TRANSLATION<br>YES   NO       |
|  | BB |  |                     |                                |       |                          |                               |
| OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.)   |    |  |                     |                                |       |                          |                               |
|  | BC | Ye (Geoffrey) Li, Leonard J. Cimini, Jr., and Nelson R. Sollenberger. "Robust Channel Estimation for OFDM Systems with Rapid Dispersive Fading Channels." <i>IEEE Transactions on Communications</i> , vol. 46, no. 7, pp. 902-915, July 1998.   |                     |                                |       |                          |                               |
|  | BD | Vittoria Mignone and Alberto Morello. "CD3-OFDM: A Novel Demodulation Scheme for Fixed and Mobile Receivers." <i>IEEE Transactions on Communications</i> , vol. 44, no. 9, pp. 1144-1151, Sept. 1996.  |                     |                                |       |                          |                               |
|  | BE | Ye (Geoffrey) Li. "Simplified Channel Estimation for OFDM Systems with Multiple Transmit Antennas." <i>IEEE Transactions on Wireless Communications</i> , vol. 1, no. 1, pp. 67-75, Jan. 2002.   |                     |                                |       |                          |                               |
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|  | BG | Alexandre Ribeiro Dias, Stephanie Roquette and Karine Gosse. "MTMR Channel Estimation and Pilot Design in the Context of Space-Time Block Coded OFDM-Based WLANs." Centre de Recherche de Motorola, Paris. Available online at <a href="http://www.telecom.ntua.gr/fitness/dissemination/MOT-mtmtmr_channel_estimation_wlan.pdf">http://www.telecom.ntua.gr/fitness/dissemination/MOT-mtmtmr_channel_estimation_wlan.pdf</a> |                     |                                |       |                          |                               |
|  | BH | Erik G. Larsson, Guoqing Liu, Jian Li, and Georgios B. Giannakis. "Joint Symbol Timing and Channel Estimation for OFDM Based WLANs." <i>IEEE Communications Letters</i> , vol. 5, no. 8, pp. 325-327, Aug. 2001.   |                     |                                |       |                          |                               |
|  | BI | Hui Liu and Ufuk Tureli. "A High Efficiency Carrier Estimator for OFDM Communications." <i>IEEE Communications Letters</i> , vol. 2, no. 4, pp. 104-106, Apr. 1998.  |                     |                                |       |                          |                               |
|  | BJ | J. Stott. "The Effects of Phase Noise in COFDM." <i>EBU Technical Review</i> , pp. 1-22, Summer 1998.  |                     |                                |       |                          |                               |
| EXAMINER   |    |  |                     | DATE CONSIDERED                |       |                          |                               |
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|   | CA |  |                     |                                |       |                          |                               |
| FOREIGN PATENT DOCUMENTS  |    |  |                     |                                |       |                          |                               |
|   |    | DOCUMENT<br>NUMBER   | PUBLICATION<br>DATE | COUNTRY                        | CLASS | SUB-CLASS                | TRANS-<br>LATION<br>YES   NO  |
|   | CB |  |                     |                                |       |                          |                               |
| OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.)  |    |  |                     |                                |       |                          |                               |
|   | CC | Jan-Jaap van de Beek, Ove Edfors, Per Ola Borjesson, Mattias Wahlqvist and Christer Ostberg. "Channel Estimation in the Uplink of an OFDM System." <i>NRS Symposium</i> , pp. 32-35, Lund, Sweden, August 1996.  |                     |                                |       |                          |                               |
|   | CD | SeongHo Ha, Inho Hwang and HwangSoo Lee. "A Decision-Directed Frame Synchronization Algorithm for OFDM Systems." <i>IEICE Trans. Communication</i> , vol. E83-B, no. 7, pp.1563-1566, Jul. 2000.   |                     |                                |       |                          |                               |
|   | CE | Thomas Keller, Lorenzo Piazza, Paolo Mandarini and Lajos Hanzo. "Orthogonal Frequency Division Multiplex Synchronization Techniques for Frequency-Selective Fading Channels." <i>IEEE Journal on Selected Areas in Communications</i> , vol. 19, no. 6, pp. 999-1008, Jun. 2001.   |                     |                                |       |                          |                               |
|   | CF | I. Barhumi and M. Moonen. "Pilot Tone-based Channel Estimation for OFDM Systems with Transmitter Diversity in Mobile Wireless Channels." from <i>Proceedings of the program for research on integrated systems and circuits (ProRISC)</i> , Veldhoven, The Netherlands, pp. 270-275, Nov. 2001.                                      |                     |                                |       |                          |                               |
|   | CG | Nils Sundstrom, Ove Edfors, Per Odling, Hakan Eriksson, Timo Koski and Per Ola Borjesson. "Combined Linear-Viterbi Equalizers-A Comparative Study and A Minimax Design." <i>IEEE Vehicular Technology Conference</i> , pp. 1263-1267, Stockholm, Sweden, Jun. 1994.  |                     |                                |       |                          |                               |
|   | CH | J H Stott. "Explaining Some of the Magic of the COFDM." From <i>Proceedings of 20th International Television Symposium 1997</i> , Montreux, Switzerland, Jun. 13-17, 1997. Available online at <a href="http://www.bbc.co.uk/rd/pubs/papers/paper_15/paper_15.html">http://www.bbc.co.uk/rd/pubs/papers/paper_15/paper_15.html</a> . |                     |                                |       |                          |                               |
|   | CI | Ufuk Tureli, Hui Liu and Michael Zoltowski. "OFDM Blind Carrier Offset Estimation: ESPRIT." <i>IEEE TRANSACTIONS ON COMMUNICATIONS</i> , vol. 48, no. 9, September 2000.   |                     |                                |       |                          |                               |
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| OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.)  |    |  |                      |                                |       |                          |                               |
|   | DC | Jan-Jaap van de Beek, Ove Edfors, Magnus Sandell, Sarah Kate Wilson and Per Ola Borjesson. "On Channel Estimation in OFDM Systems." Division of Signal Processing Lule University of Technology, Sweden & Purdue University School of Electrical Engineering USA, Proceedings at IEEE VTC 95, Chicago, 1995. Available online at <a href="http://www.sm.luth.se/csee/sp/research/conference/On_Channel_Est_in_OFDM_Syst.pdf">http://www.sm.luth.se/csee/sp/research/conference/On_Channel_Est_in_OFDM_Syst.pdf</a> . |                      |                                |       |                          |                               |
|   | DD | M. Julia Fernandez-Getino Garcia, Ove Edfors and Jose M. Paez-Borrallo. "Joint 2D-Pilot-Symbol-Assisted-Modulation and Decision-Directed Frequency Synchronization Schemes For Coherent OFDM." Proc. ICASSP'2000, vol 5, pp. 2961-2964. Istanbul, Turkey, June 2000.   |                      |                                |       |                          |                               |
|   | DE | Ye (Geoffrey) Li. "Simplified Channel Estimation for OFDM Systems With Multiple Transmit Antennas." IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, vol. 1, no. 1, pp.67-75, January 2002.   |                      |                                |       |                          |                               |
|   | DF | Michele Morelli and Umberto Mengali. "A Comparison of Pilot-Aided Channel Estimation Methods for OFDM Systems." IEEE TRANSACTIONS ON SIGNAL PROCESSING, vol. 49, no. 12, pp.3065-3073, December 2001.  |                      |                                |       |                          |                               |
|   | DG | B. Muquet, M. de Courville, G.B. Giannakis, Z. Wang and P. Duhamel. "Reduced Complexity Equalizers For Zero-Padded OFDM Transmissions." Intl. Conf. on Acoustics, Speech and Signal Processing, June 2000, Istanbul, Turkey. Available online at <a href="http://clue.eng.iastate.edu/~zhengdao/publications/papers/mcgw00.pdf">http://clue.eng.iastate.edu/~zhengdao/publications/papers/mcgw00.pdf</a> .   |                      |                                |       |                          |                               |
|   | DH | Ove Edfors, Magnus Sandell, Jan-Jaap van de Beek, Daniel Landstrom and Frank Sjöberg. "An Introduction to Orthogonal Frequency-Division Multiplexing." Research Report TULEA 1996:16, Div. of Signal Processing, Luleå University of Technology, Luleå, Sept. 1996.  |                      |                                |       |                          |                               |
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|  | EA |   |                     |                                |       |                          |                               |
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|  | EB |   |                     |                                |       |                          |                               |
| OTHER DISCLOSURES (Including Author, Title, Date, Pertinent Pages, Place of Publication, Etc.)   |    |   |                     |                                |       |                          |                               |
|  | EC | Takeshi Onizawa, Masato Mizoguchi and Masahiro Morikura. "A Novel Channel Estimation Scheme Employing Adaptive Selection of Frequency-Domain Filters for OFDM Systems." <i>IEICE Trans. Comm.</i> , vol. E82-B, no. 12, pp.1923-1930, December 1999.  |                     |                                |       |                          |                               |
|  | ED | Magnus Sandell and Ove Edfors. "A Comparative Study of Pilot-Based Channel Estimators for Wireless OFDM." Div. Signal Processing, Luleå Univ. Technol., Luleå, Sweden, Res. Rep. TULEA 1996: 19, Sept. 1996.  |                     |                                |       |                          |                               |
|  | EE | Erik Lindskog and Claes Tidestav. "Reduced Rank Channel Estimation." <i>IEEE Vehicular Technology Conference</i> , Houston, TX, May 16-20, 1999, pp 1126-1130.  |                     |                                |       |                          |                               |
|  | EF | Heiko Schmidt, Volker Kuhn and Karl-Dirk Kammeyer. "Channel Tracking in Wireless OFDM Systems." The 5 <sup>th</sup> World Multi-Conference on Systemics, Cybernetics and Informatics, SCI 2001, July 22-25, 2001, Orlando, Florida USA. Available online at <a href="http://www.ant.uni-bremen.de/whomes/schmidt/papers/sci2001.pdf">http://www.ant.uni-bremen.de/whomes/schmidt/papers/sci2001.pdf</a> . |                     |                                |       |                          |                               |
|  | EG | Ove Edfors, Magnus Sandell, Jan-Jaap van de Beek, Sarah Kate Wilson and Per Ola Borjesson. "OFDM Channel Estimation by Singular Value Decomposition." <i>IEEE Trans. Commun.</i> , vol. 46, pp. 931-939, July 1998.   |                     |                                |       |                          |                               |
|  | EH |   |                     |                                |       |                          |                               |
|  | EI |   |                     |                                |       |                          |                               |
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